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## Helminth Fauna of Bats in Japan XVI

With 10 Text-figures

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ABSTRACT Forty-eight horse-shoe bats, representing two species, *Rhinolophus cornutus* and *R. ferrumequinum*, were collected in the caves of Hyôgo and Iwate Prefectures during July to August, 1974, and examined for helminths. Two new species of cestodes, *Oligorchis brevihamatus* n. sp. and *Vampirolepis iwatensis* n. sp., and two species, *Insectivorelepis okamotoi* and *Hymenolepis rashomonensis*, were found from these bats.

The author collected nine bats, *Rhinolophus ferrumequinum*, in the wave-cut cave, Jigoku-gokuraku-dômon, at Kasumi in Hyôgo Prefecture on July 21, 1974. After each bat was killed, it was dissected for internal study. As indicated in Table 1, all the bats were infected by helminths. Included among the helminths recovered were two species of trematodes, a species of cestode and at least three species of nematodes. All the helminths were found in the small intestine.

Table 1  
Summary of helminths from bats taken in Jigoku-gokuraku-dômon.

Bat number		1	2	3	4	5	6	7	8	9
Cestoda <sup>1)</sup>	Adult	1	0	0	0	0	9	0	0	0
	Larva	0	0	5	0	0	4	1	0	0
Trematoda <sup>2)</sup>		26	91	511	192	25	43	11	61	104
Nematoda <sup>3)</sup>		1	1	11	0	2	1	8	2	2

1) *Insectivorelepis okamotoi* Sawada.

2, 3) Unidentified species.

*Insectivorelepis okamotoi* Sawada

Worm length 21 to 28 mm, maximum width 0.65 to 0.69 mm, consisting of 92 to 112 proglottides. Scolex 0.304 mm long and 0.235 to 0.277 mm wide. Suckers 0.111 mm in diameter. Rostellum absent. Neck 0.28 to 0.69 mm long and

0.15 to 0.16 mm wide. Genital pore unilateral, located anterior to the middle of proglottid margin. Cirrus sac 0.056 to 0.070 mm long and 0.028 to 0.035 mm wide. External and internal seminal vesicles present. Ovary oval, 0.042 to 0.046 mm by 0.049 to 0.053 mm. Egg 0.046 mm in diameter. Onchosphere spherical, 0.032 to 0.035 mm in diameter; embryonic hooks 0.014 mm long.

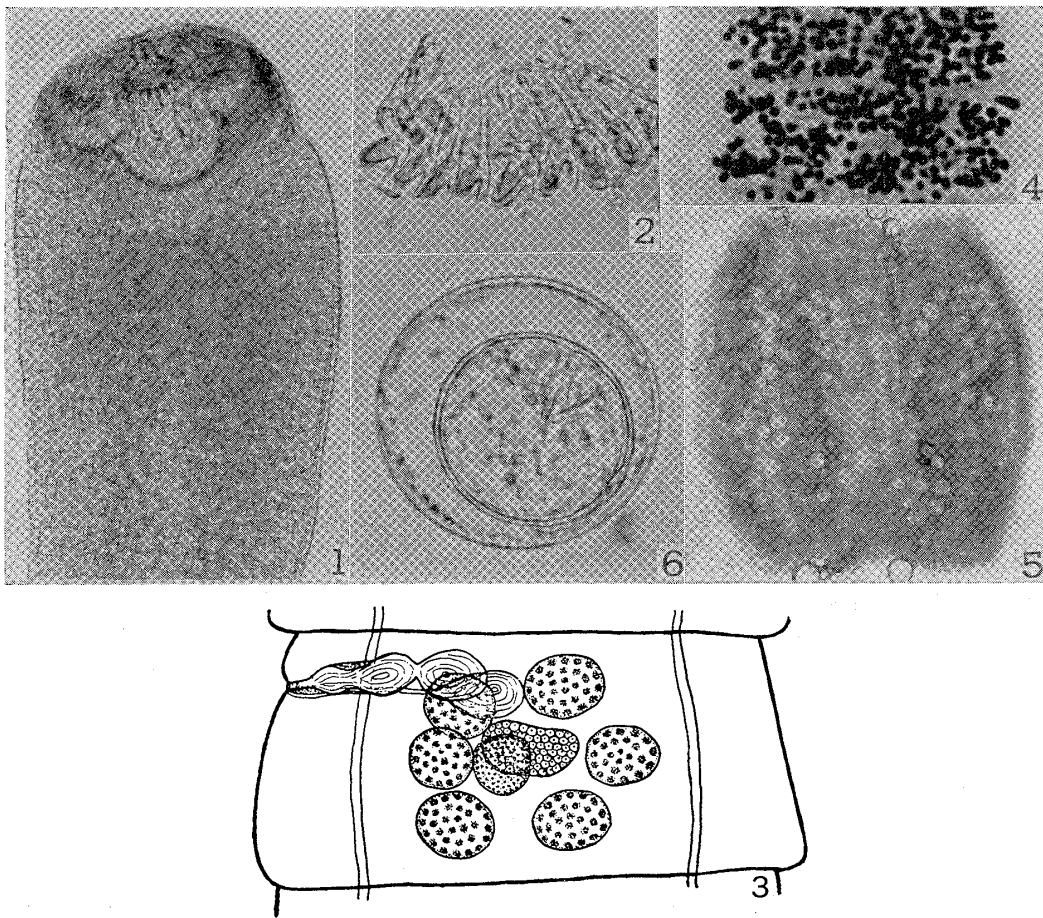
On August 26, 1974, six small horse-shoe bats, *Rhinolophus cornutus*, were collected in the limestone cave, Amabutai-no-ana, at Amabutai, Iwaizumi Town, Iwate Prefecture. On dissection, the bats were found not to be infected by tapeworms. On August 27, ten other bats of the same species were collected in the limestone cave, Oname-ana, at Akka, Iwaizumi Town, but only one of the ten was found to be infected by a tapeworm, *Vampirolepis isensis*. Further ten individuals of *R. cornutus* were collected in the limestone cave, Momonoki-dô at Akka. All were not infected by tapeworms. On August 28, three common horse-shoe bats, *R. ferrumequinum*, and ten small horse-shoe bats, *R. cornutus*, were collected in the limestone cave, Iwai-kutsu, Yamane, Kuji City, Iwate Prefecture. As shown in Table 2, two of three *R. ferrumequinum* and one of ten *R. cornutus* were found to be infected by two new and a known species of tapeworms.

Table 2  
Summary of tapeworms from bats taken in Iwai-kutsu.

Bat			Tapeworm	
Number	Species	Sex	Number	Species
1	<i>Rhinolophus ferrumequinum</i>	♀	0	
2	" "	♀	4	<i>Oligorchis brevihamatus</i> n. sp.
3	" "	♂	2	<i>Hymenolepis rashomonensis</i>
4	<i>Rhinolophus cornutus</i>	♂	0	
5	" "	♂	0	
6	" "	♂	0	
7	" "	♂	0	
8	" "	♂	0	
9	" "	♀	0	
10	" "	♂	0	
11	" "	♀	0	
12	" "	♂	2	<i>Vampirolepis iwataensis</i> n. sp.
13	" "	♂	0	

*Oligorchis brevihamatus* n. sp.

The length of the worm reaches 35 to 42 mm, while the maximum width is about 1.1 mm. The segments are broader than long except for terminal senile segments. The scolex is somewhat round in outline when the rostellum is invaginated, measuring 0.280 to 0.350 mm long and 0.245 to 0.280 mm wide. The rostell-



Figs. 1-6. *Oligorchis brevihamatus* n. sp.—1. Scolex ( $\times 120$ ).—2. Rostellar hooks ( $\times 750$ ).—3. Outline of mature proglottid.—4. Gravid proglottides ( $\times 50$ ).—5. Senile proglottid ( $\times 50$ ).—6. Onchosphere ( $\times 530$ ).

lar sac is 0.112 mm long and 0.077 mm wide. The rostellum, measuring 0.091 to 0.098 mm long and 0.049 mm wide, is armed with 26 hooks, 0.021 mm long, which are arranged in alternating double rows; the blade of hook is curved, shorter than the handle, the guard is prominent. The unarmed four suckers are rounded and have a diameter of 0.070 to 0.077 mm. The neck attains a length of about 0.145 to 0.175 mm and a width of 0.16 to 0.21 mm. The genital pores are unilateral and are situated in the anterior half of the segment margin. The testes are six in number, three aporal and three poral, and usually situated within lateral margins of excretory vessels. They surround the ovary and the vitelline gland in a circle. The cirrus pouch is well developed, extending over the longitudinal excretory canal; it measures 0.081 to 0.086 mm long and 0.025 to 0.028 mm wide. The cirrus is unarmed. The internal and external seminal vesicles are present; the former measures 0.053 to 0.060 mm long and 0.035 mm wide, the latter 0.039 to 0.046 mm long and 0.032 to 0.035 mm wide. The vagina is a narrow tube opening ventral to the cirrus

pouch. The seminal receptacle is oval in outline; it measures 0.035 mm by 0.042 mm. The transversely oval ovary lies in the median line and attains 0.063 to 0.073 mm by 0.035 to 0.042 mm. The spherical vitelline gland lies close behind the ovary and attains 0.039 mm by 0.028 to 0.035 mm. The uterus in gravid segments is divided into numerous pockets and fills the region of the segment median to the longitudinal excretory canals. The thin outer envelope of the egg is rounded oval, measuring 0.032 mm in diameter. The onchosphere is more or less rounded, measuring about 0.042 mm in diameter. The embryonic hook is 0.014 mm long.

*Host.* *Rhinolophus ferrumequinum*.

*Habitat.* Small intestine.

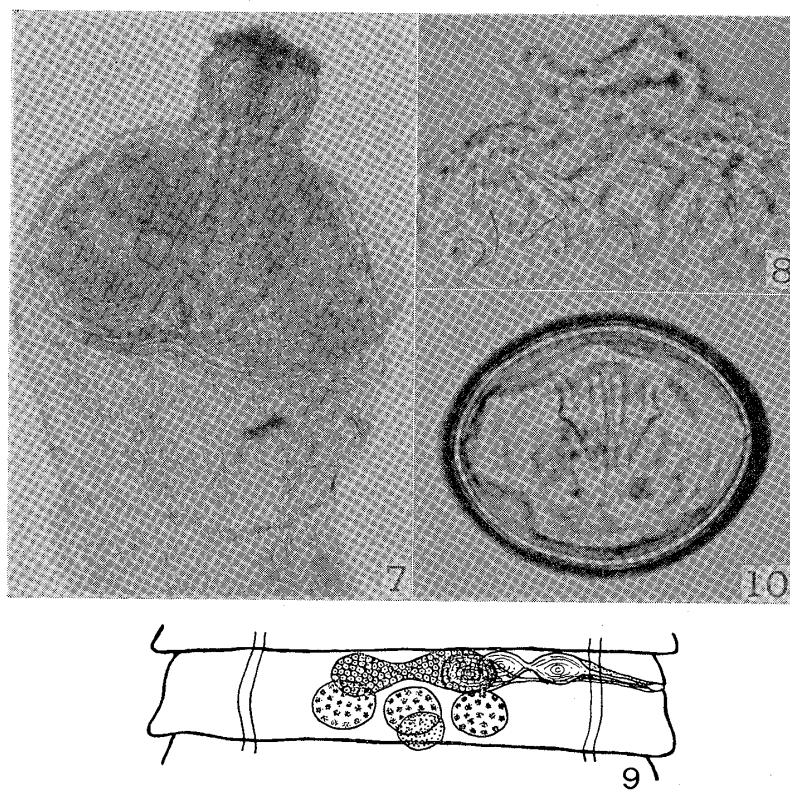
*Locality and date.* Yamane, Kuji City, Iwate Prefecture; August 28, 1974.

*Type depository.* Biological Laboratory, Nara University of Education, Nara, Japan.

*Discussion.* The species with more than four testes in the genus *Oligorchis* are: *Oligorchis paucitesticulatus* Fuhrmann, 1913, from *Aegialitis hiaticula* and *Vanellus vanellus*, *O. kwangensis* Southwell et Lake, 1939, from *Galachrysis nuchalis nuchalis*, *O. nonarmatus* Neiland, 1952, from *Tamiasciurus d. douglasii*, and *O. p. paucitesticulatus* Deblok et Rosé, 1964, from *Charadrius hiaticula*. Among these, the three species excepting *O. nonarmatus* occurred in Aves. In *O. nonarmatus* from the yellow-bellied squirrel, the rostellum is absent. The present species closely resembles *Oligorchis p. paucitesiticulatus*, but can be readily separated from the latter by the number and the length of the rostellar hooks and arrangement of the testes: *O. p. paucitesticulatus* possesses 10 hooks of 0.015 mm long, while *O. brevihamatus* has 26 hooks of 0.021 mm long, and in the former the testes are arranged in a transverse row, while in the latter they surround the ovary and the vitelline gland in a circle.

### *Vampirolepis iwatensis* n. sp.

Strobila length 60 to 75 mm; greatest width 1.2 to 1.8 mm. Margins of strobilas serrate. Scolex 0.210 to 0.245 mm long and 0.224 to 0.231 mm wide; rostellum 0.161 mm long and 0.070 mm wide, its distal end armed with a single row of 23 hooks, each measuring 0.0245 mm in length. Rostellar sac 0.182 mm long and 0.077 mm wide. Oval sucker unarmed, 0.084 to 0.091 mm in diameter. Neck 0.455 mm long and 0.154 mm wide. Genital pores unilateral, situated in anterior half of segment. Cirrus sac elongate, 0.091 to 0.105 mm long and 0.028 to 0.035 mm wide. Three testes oval, 0.084 to 0.091 mm by 0.063 to 0.070 mm, one poral and two aporal in position; arranged in a transverse row. External seminal vesicle 0.053 by 0.042 mm and internal seminal vesicle 0.042 by 0.032 mm. Ovary transversely bilobate, 0.210 mm in width. Vitelline gland, 0.091 to 0.098 mm by 0.049 to 0.056 mm, posterior to ovary, overlapping central testis. Seminal receptacle



Figs. 7-10. *Vampirolepis iwatensis* n. sp.—7. Scolex ( $\times 190$ ).—8. Rostellar hooks ( $\times 600$ ).—9. Outline of mature proglottid.—10. Onchosphere ( $\times 950$ ).

prominent, 0.053 mm by 0.053 to 0.063 mm. Vagina opening posterior to male genital opening. Uterus, in gravid segments, sac-like and lobed, filling a region of segment median to longitudinal excretory canals. Eggs 0.032 to 0.039 mm in diameter, surrounded by four envelopes, the outermost one of which is pretty thick, but the rest very thin; first egg membrane adhered to onchosphere, second one 0.028 by 0.032 mm and third one 0.030 by 0.033 mm; outermost envelope 0.003 mm in thickness. Onchosphere spherical, 0.021 to 0.025 mm in diameter and embryonic hook 0.014 mm in length.

*Host.* *Rhinolophus cornutus*.

*Habitat.* Small intestine.

*Locality and date.* Yamane, Kuji City, Iwate Prefecture, August 28, 1974.

*Type depository.* Biological Laboratory, Nara University of Education, Nara, Japan

*Discussion.* The present species closely resembles *Vampirolepis isensis* Sawada from *Rhinolophus cornutus* and *R. ferrumequinum*. However, it differs from *V. isensis* in the length of rostellar hooks, which measures 0.0245 mm long as contrasted with 0.032 mm long in *V. isensis*, in the arrangement of the testes, ovary and vitelline gland and in the shape of the ovary.

*Hymenolepis rashomonensis* Sawada

Strobila length 32 to 35 mm; maximum width 0.6 to 0.7 mm. Neck 0.7 mm long and 0.15 mm wide. Segment number 173 to 182. Scolex 0.28 to 0.32 mm long and 0.301 mm wide. Unarmed suckers 0.112 mm in diameter. Rostellum rudimentary. Genital pores unilateral, situated in anterior half of segment margin. Eggs 0.039 to 0.042 mm by 0.035 mm; onchosphere spherical, 0.028 to 0.032 mm by 0.032 to 0.034 mm; embryonic hooks 0.014 mm long.

*Vampirolepis isensis* Sawada

On the anatomy of the worm, nothing could be added to the author's detailed description given in one of his previous papers (1966).

## ACKNOWLEDGMENT

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